Product and Technology Management: Learning to Juggle in the Age of Paradox

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The leading-edge R&D executives who gathered to discuss product and technology management at the Arthur D. Little colloquium represented companies of vastly different sizes, industries, cultures, and histories. *Yet* as the two-day session unfolded and participants identified their key challenges and best practices, there was a clear congruence of experience. These senior managers saw the world through much the same eyes – whether their companies made prescription drugs or postage meters, satellites or shaving products, mailing labels or military hardware. And they shared many of the same goals and frustrations.

Here's what they saw:

In an era of unforgiving competition and accelerating change, new products are the lifeblood of competitive success. But the life cycles of successful new products grow ever shorter. This shrinkage makes the technologies and management processes that generate streams of such products even more valuable. And the costs and risks of those technologies and processes continue to increase, as the competitive impact of failure increases.

The high-stakes reality: for product and technology management, the opportunities – and the dangers – have never been greater.

Defining Product and Technology Management

The first step for the Arthur D. Little colloquium was to define the topic of the colloquium itself. Words as common as „technology" and „product development" mean different things to different people. So just what were we there to discuss? Could the group „bound the problem" by agreeing on the basic parameters of the product and technology management processes?

The search for consensus became an intriguing joumey through the layers of issues associated with products and technology. In the end, the executives did settle on a definition – a wordy definition, most would agree, but one that captured the rich dimensions of their work.

The process began with a definition offered by Arthur D. Little. The goal of the colloquium, facilitator Kitt Johnson suggested, was to focus on the processes that generate new products that create value for customers, as well as on upstream activities – research, joint ventures, alliances, strategic relationships – designed to create and enhance key technologies and technology platforms that feed into the product development process.

Donald Hetzel, Vice President, Research and Development, of Becton Dickinson, wanted more emphasis on the hard-headed business realities. „The essence of product development," he said, „is to apply science to solve problems, and by solving problems, to make money for the firm."

Arthur Chester, Senior Vice President, Research and Technology, of GM Hughes Electronics Corporation, put a different spin on Hetzel's point: „We take people with a scientific background and use them to turn a small amount of money into a large amount of money. The question is always: What can these people do to create value?"

This question, of course, raises another: What creates value?

„The commercialization of things that are new in the mind of the customer," offered Paul Germeraad, Vice President and Director of Corporate Research at Avery Dennison.

Paul Reece, Vice President, Operations and Technology, of Pitney Bowes, agreed: „Our job is to identify customer wants and needs, marry them to the innovative use of technology, and achieve products and services that delight the customer and provide attractive returns to the constituents of the enterprise."

Paritosh Chakrabarti, Vice President, Science and Technology, of PPG Industries, wasn't quite satisfied with this financially driven perspective on value. *To* him, there was an important social component as well. Product development, he said, „is the force at the root of social value creation and improving the quality of life. It is the basis for which we exist as a business."

The „social dimension" of innovation and R&D quickly became a prominent factor in the discussion, and not just in the sense of the society outside the walls of the corporation, but in the sense of the social dimension of the corporation itself – the organization, people, and culture.

To John Bush, Vice President, Corporate Research and Development, of Gillette, product development was „The social process for converting knowledge into things that people will value and thus pay you for."

„The human side is so important," Chakrabarti added. „We tend to look at technology and innovation in terms of dollars and cents. But unless you have a motivated team, nothing happens. Ultimately, people make things happen. And there is more to motivation than money. When people see that what they are doing is meaningful, you create a powerful force. Often, in all of our focus on material resources, we miss that."

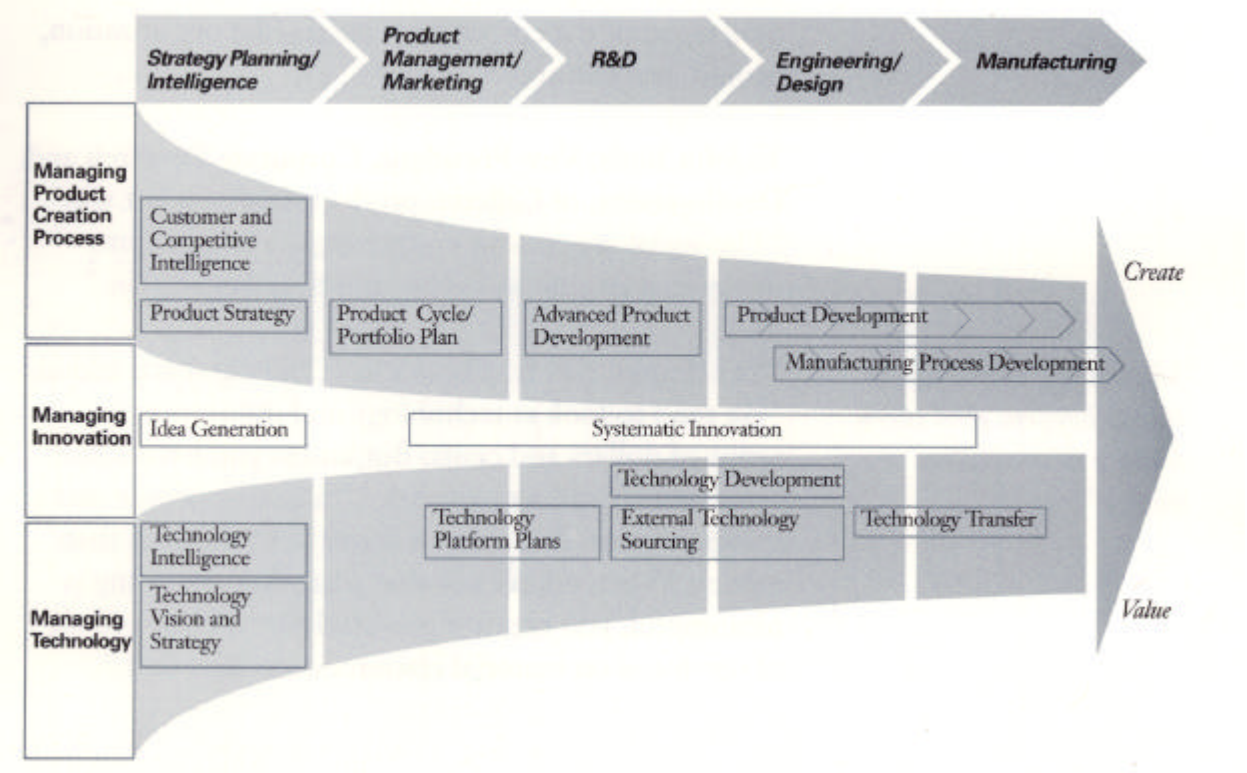
Nowhere is that more true, said Ford Calhoun, than in his business. „In pharmaceuticals, the driving force behind much of the science is the passion and commitment of the true believers. And these true believers rarely care about money." Calhoun is SmithKline Beecham's Senior Vice President and Director of Scientific and Clinical Systems.

Arthur Chester of GM Hughes Electronics Corporation wanted more. „There's still a missing ingredient for me," he said. „We're implying that our companies are going to innovate and then apply what we innovate. But for my company, and lots of others, many of the best ideas come from the outside. We do an awful lot of borrowing."

At this point, Bruce Thompson of Arthur D. Little offered a schematic diagram of product and technology management (Exhibit 1). His chart identified three interlinking processes that flow from the business vision, mission, and strategy and combine to create value for the customer. Each of these processes is cross-functional in nature, integrating inputs from the main-value-chain functional activities.

Exhibit 1

Technology and Product Development Process



First, there is the process for managing product creation: creating quickly and cost-effectively a stream of innovative new products high in customer value. Second, there is the innovation management process: identifying, screening, and enriching a flow of new ideas and ensuring systematic innovation in downstream development and implementation. Finally, there is the technology management process: creating a technology vision and platform strategy and implementing it through a combination of internal development and external technology sourcing.

The participants agreed that the schematic diagram captured the „process dimension" of what they were struggling with. But several executives emphasized that no effort to „map" product development could capture the intangible dimension: the cultural – even spiritual – side of innovation.

„Technology and product development is like society's life force," said PPG's Paritosh Chakrabarti. „But how do you diagram a life force? There's an essence to what we do – the social value of creation – that you just can't capture in a diagram. A biologist can explain a lot, but he or she can't capture what a philosopher sees in life."

„It's like diagramming a sentence without knowing the content," said another participant. „It's valuable, but it's not the whole story."

Indeed, the very idea of „systematic" innovation troubled a few of the executives.

„The idea of a system has to be a loose-tight thing," said GM Hughes Electronics Corporation's Arthur Chester. „You have to have a tightness that says innovation is part of a process. But you have to have a looseness that says, I'm not going to stifle creativity."

The ultimate goal, everyone agreed, is to have it both ways: to make the development process more „systematic" – and thus make the outcomes more „predictable" – without undermining creativity.

For the pharmaceutical industry, Ford Calhoun of SmithKline Beecham emphasized, there are dramatic benefits to greater predictability.

„The kind of disciplined management that's emerged in industries with lower margins hasn't been applied typically within the pharmaceutical industry, but this situation is changing rapidly," he said. „One in 10,000 chemical entities ends up being a marketable compound. It costs $200 million and takes 10 to 12 years to bring such a compound to market – and most are failures. If we had more certainty during a project about the chances of its success, or about the business impact of its success, it would have a huge impact."

But what about the creativity of those „true believers" Calhoun had discussed earlier? Gillette's John Bush offered a simple but powerful question: „Can you really have systematic chaos? Can you create organized anarchy?"

Two hours after the search began, the group settled on a focus for the work that would follow. Product and technology management should embrace the broad collection of activities – guided by product and technology strategies and implemented through systematic but innovative processes – that combine to create value:

• For the customers – in terms of product quality, performance excitement, competitive cost, and timeliness

• For other key stakeholders – in terms of profitability, employee satisfaction, and social value creation

Nobody ever said product development was easy.

On Strategic Vision and Core Competencies

In a world of global competition and constant change, how can R&D managers discover the products they need if they don't know what they're looking for?

Robert J. Wills, Vice President, Project Planning and Management, of The R.W. Johnson Pharmaceutical Research Institute of Johnson & Johnson, emphasized the importance of a new „market" vision – seeing who the real customer is. „We are radically redefining our customers and what our products have to do," Wills explained. „Our customers used to be the doctors. No more. Now there are ranges of providers (HMOs), buyers (government and private health plans), and regulators. Today, new products simply must add value. That wasn't always true. In our industry, companies would come out with products that looked, smelled, and tasted like other products. No more. We can't just make safe and effective products. We need to create distinct value for our customers."

Dan Irwin of the FMC Corporation emphasized that technology vision is key not only to the survival of the company but to the future of the technology function itself. „We recently did a survey of some key general managers and technical managers in the company," Irwin told the group. „There were two conclusions, conclusions that many companies could identify with. One, technology could be used to a greater extent to create competitive advantage in several of our businesses. Two, a stronger sense of urgency was needed to change the situation. How do we motivate the organization in general – and nontechnology managers in particular – to devote the necessary resources to technology in order to achieve a high level of value-creating output?"

Philip Metz of Arthur D. Little made the point even more starkly. „Very high-level people in very big companies are asking, 'Why do we need R&D?' We have to convey to our colleagues, especially our senior colleagues, the importance of technology. Vision and core competence aren't just words. They are critical to the future competitiveness of the business."

So why is technology vision so hard?

„Technology and business are necessarily out of phase in the cycle of things," speculated PPG's Chakrabarti. „When a business is performing well, it's based on a technology from yesterday. Unfortunately, our future activities in technology are guided by the success of today. There's a mismatch. The seeds of destruction are planted at the peak of success. History is often the worst enemy in charting the future."

One consequence of lack of vision, said Paul Reece of Pitney Bowes, is that companies satisfy themselves with incremental advances. „It's much easier to do incremental things than to go for big wins," he said. „But is that what we should be shooting for? Base hits win games. But do they win championships?"

Chakrabarti offered some best-practice thinking on how PPG aims for big wins. Over the last 10 years, PPG has played the downsizing game as successfully as anyone. Most of the company's operations – from automotive coatings to glass to basic chemicals – are in mature markets. Still, PPG has posted healthy profits and solid returns to shareholders – 21 percent per year over the past decade. Now, he said, the company wants to play for growth. But growth requires vision. And vision, at least for PPG, requires that the company divide growth opportunities into discrete categories.

One category of growth, Chakrabarti explained, is „concentric" growth. „These are opportunities in business areas where we already exist. We know the market; we know the participants." Chakrabarti further divided concentric growth into two subcategories: incremental and leapfrog.

„The key to incremental growth is significant dialogue with the customer," Chakrabarti said. „In 1982 our particulate silica business was rated a Category 7 – a candidate for divestiture. The guy who ran the business and I sat down with our customers, worked together, and asked questions about the next generation of products. Back then, we had zero share of the battery separator market. Today we have a 90 percent share. The key was dialogue with customers."

Technology leapfrog opportunities, Chakrabarti said, „are innovations whose value is so clear that you don't need dialogue with individual customers."

He gave an example: photochromic plastic for eyeglass lenses. Corning, which dominates the market for glass lenses, demonstrated that there is a huge demand for lenses that change color. But glass lenses represent only 20 percent of the market. Clearly, there was an opportunity for photo-gray equivalents using a plastic lens. According to Chakrabarti, seizing the opportunity required technical breakthroughs, not market research.

„We created a task force of 10 people, put them in a room, and chartered them to solve the problem," Chakrabarti said. „We already had organic molecules that changed color. But organic molecules are bright colors: red, blue, green. Could we create gray? Ten people working together solved that problem. Their work created what we call a 'leapfrog beachhead' – in effect, a technology stake in the ground."

That beachhead quickly turned into a business. PPG's photochromic lens business was generating revenue of $100 million after two years, Chakrabarti reported. That revenue is expected to grow to $500 million in year five.

Innovation in unrelated markets – the second growth category – carries a different set of requirements and risks. „Ten years ago, we were primarily a manufacturer of commodity chemicals," Chakrabarti said. „'How', we asked ourselves, 'do we become a leader in performance chemicals?' We considered a number of different areas, and then we said, 'Let's all believe in one area.' Today we are a leader in the surfactants business... It's a top-down process. Commitment from the top is an essential part of becoming a leader in a new area – especially since there will be failures."

Indeed, Chakrabarti described PPG's $500 million effort – ultimately unsuccessful – to develop radically new ways to make glass. „People started asking, 'Do we really need to be leaders in technology to win in this business?' Some said, 'No, we can be fast followers.' It took us time to recover from that failure."

Paul Reece saw much to echo in Chakrabarti's discussion. „We've been pursuing the same approach at Pitney Bowes, even to the point of using the same words," he said. „We talk about concentric growth and beachheads. We are trying to talk about process in the same way. As in the case of PPG and surfactants, it takes commitment from top to bottom to take a relatively high-risk journey into a new area. We have trouble getting a commitment to technologies that are not perceived as core."

The Measurement Challenge

Over the course of the two-day gathering, much discussion focused on metrics as the way to narrow the gulf between best intentions and best practice, to communicate the business value of technology to nontechnological colleagues, and to assess the company's R&D performance. All the executives around the table were hungry for tools to translate strategic vision into R&D milestones and to communicate the value of technology to their business colleagues. Few were satisfied with their current options.

One frustration was that „best practice" in this area often draws on intuition and gut feeling. In his presentation on measuring the value of R&D, Arthur D. Little's Metz made the point directly. „The best companies tend to rely on the professional judgment of their people," he said. „They hire good people and take their advice. Companies that are weaker apply metrics more mechanistically." Or, as a client once quipped to Metz, „R&D's job is to create a buffet of wonderful ideas. My job is to have good taste."

Paul Germeraad of Avery Dennison recognized the importance of hard-to-quantify professional judgment. But he also believed there were more quantitative approaches to measuring R&D performance. He shared with the group R&D performance indices that he had developed, working with a network of quality directors associated with the Industrial Research Institute.

„When we started," Germeraad said, „everyone wanted magic bullets: Here are the five key metrics to measure the value of R&D output. It doesn't work that way. You've got to segment metrics based on time. Certain indicators help quantify the future impact of R&D. Others measure the company's technology position today. Lagging indicators quantify how past R&D is contributing to the current state of the business...

You can also segment metrics based on performance categories. In-process measures look at activities inside the R&D organization. Output measures look at the technical results R&D is producing. Outcome measures capture the business consequences of these technical outputs."

Using the dimensions of time and performance, Germeraad and his colleagues created an R&D matrix that provides a set of indicators relevant to a wide range of companies. But this matrix is only a start, he cautioned. Every company must make its own decisions about the right things to measure and how to measure them.

„Certain metrics are clearly dysfunctional," Germeraad continued. „For example, the number of patents filed and the number of publications. In general, it really helps to have metrics that look like 'run charts' or 'flow charts' – that have a dynamic element. For products where complexity is the limiting factor, we measure progress against goals and commitments. For products where creative thought is the limiting factor, we measure project-completion indices. They give us a feel for how the creative process is going."

„Have these metrics changed behavior?" one participant asked. „*Yes*, without question," said Germeraad.

It's the same everywhere: What gets measured gets attention.

On Integration and Alignment

The executives agreed that technology organizations need a way to make sense of their environment, guide their day-to-day thinking, and create a product-development trajectory – in short, a vision.

But vision alone is not enough. There must be a way to translate that vision into changed behaviors. The first step, the executives agreed, is to link the vision with concrete goals and metrics, and to communicate those goals to the rest of the organization – to achieve an organizational „buy-in" that helps people at all levels internalize the vision and energizes them to act on it.

„Organizationally, how do we get better integration and cooperation between product planning, marketing, and the technical people?" Pitney Bowes' Reece wondered. „How do we promote the convergence of product planning and technical capability? It's one of our most difficult challenges – we never agree." It was a common lament.

„Too often," said Becton Dickinson's Hetzel, „the two sides come together in the product development phase. But that's too late. You discover, after spending a few million dollars, that your technical people and your marketing people speak different languages."

Reece reported on a recent initiative by Pitney Bowes to improve integration. „For the first time, we've put together a technology road map for the company," he said. „The technology organization worked with the business units. We created a technology advisory board whose members are the marketing and engineering heads of the business units. I don't want them to tell us what to do, but I do want to increase the interaction between the technology groups and the business units."

John Bush explained his role in tightening the relationship between vision and implementation at Gillette. As Vice President of Corporate R&D, Bush runs an organization charged with creating new concepts for products beyond the strategic planning horizon of the operating businesses. Bush's role is to create „strategic options" for the business units: a sense of the possibilities afforded by discontinuous innovation, and a road map for how to get there.

Paul Germeraad offered a different road map to integration. Avery Dennison's „buy-in" matrix categorizes new product initiatives based on two characteristics:

how important the product is to the division's future, and how competitive the market is into which the product will be introduced?

Arthur Chester of GM Hughes Electronics Corporation described his efforts to promote integration in a world where boundaries are blurred, loyalties are split, and cultures are distinct – all within the same organization. The Hughes central research lab, Chester explained, is organized along traditional functional lines. One of its key challenges is to achieve tighter integration in three areas:

• Across the corporation's business units – especially Delco Electronics, which accounts for one-third of Hughes' revenue, but is separated from the labs by geography (Delco is based in Kokomo, Indiana; GM Hughes Electronics Corporation is in Los Angeles).

• Between corporate cultures (the GM-Hughes merger is only seven years old).

• Among its commitments to internally developed technology (for most of its history, Delco has relied on its suppliers for technology).

The solution to this integration challenge?

„We moved the boundaries into the head of one person," Chester said. „We appointed a leader whose job is to achieve integration. This person is a program manager in Hughes' central lab and a director of Delco. Researchers from Hughes' labs and Delco are co-located on the West Coast. The Delco people remain on the Indiana payroll, even though they report to this new leader. The same goes for Hughes' researchers. The leader has to defend the raises he gives the Delco people up the Delco chain of command, and he has to defend the appraisals he gives the Hughes researchers up the research chain of command."

This „mental integration" is more complex than it may sound. Most important, this new structure requires certain kinds of researchers and leaders – people capable of bridging wide culture gaps.

How does Chester determine who plays? „We send people out into the jungle and the ones who come back with their heads still attached are the ones we trust to do it," he joked. More seriously, he continued, „We handpicked people who could work across cultural lines. Customers everywhere have a low tolerance for arrogance. We sent the 'integration' leader into Delco for several months to participate in the strategic planning process there. He moved to Kokomo, spent time in the various Delco operations, sat in people's offices, and adopted the customer's culture."

Rob Wills of The R.W. Johnson Pharmaceutical Research Institute echoed this emphasis on the soft side of leadership. „The leader has to be a good listener," he said. „He or she has to be able to understand the needs of both sides of the equation. As long as you satisfy both sides, everyone is happy. But that takes special skills." And patience. „This kind of leadership job gets lots of complaints," Wills warned.

Ronald Jonash of Arthur D. Little thought this approach had potential for managing research alliances. „Scott McNealy from Sun talks about 'loosely coupled, highly aligned,'„ he said. „This sounds like a way to do that."

On Alliances and Partnerships

The growing complexity of business means that few companies can go it alone. Increasingly, technology leadership demands effective partnerships – whether with suppliers or customers, universities or government labs, or even with competitors.

Jonash captured the essence of the new realities. Referring to recent research involving leading-edge companies, he told the group, „There is a sea change in how companies achieve technological competitiveness. Companies are more and more dependent on technology that they are sourcing from the outside or developing in collaboration with suppliers."

In the 1980s, he said, companies believed that 80 percent of their technology competitiveness came from internal R&D. They invested heavily in developing core competencies and turning those competencies into products. Today, however, companies believe that internal R&D determines less than 50 percent of their technology competitiveness.

A whole range of outside interactions – passive supplier relations, active supplier relations, joint ventures and acquisitions, strategic alliances, consortia, government labs – figure more prominently in companies' competitiveness. Even more important, these companies report, outside interactions will shape the „pacing" technologies that build the markets of the future. A huge percentage of their internal research, they concede, has been directed at „base" technologies that offer no decisive advantage.

Jonash raised the management challenge: „Can companies manage their external R&D as well as they manage their internal R&D? And can they manage the integration of external and internal R&D?" Simple questions, for which effective answers require overcoming many hurdles. For example, can companies get comfortable with disinvesting in home-grown underlying technologies in order to pursue outside alliances in pacing technologies?

John Bush of Gillette sent his people through a planning exercise with this logic: „Make your five-year plans on the assumption that your budgets will increase at the same percentage rate as our sales, but your head count will increase at only one-eighth that rate." Why? „It gives people no option – it forces them to look outside."

Of course, it's easier for managers to „look" outside than to make bets on working with outsiders. „Who wants the success of their project, and perhaps the future of their career, tied to the performance of another company

over which they have no control?“ asked one of the participants. „What if those bozos screw up? Am I going to pay the price?“

PPG’s Chakrabarti raised a different concern, particularly with respect to university-industry partnerships. „The trouble with pushing these relationships,“ he warned, „is that there is no track record of success.“ Chakrabarti spoke ruefully of an alliance with a nonprofit research institute, which, he said, accomplished little and cost PPG $46 million.

Others in the group spoke of successful alliances. Donald Hetzel spoke enthusiastically about a collaboration between Becton Dickinson and the Massachusetts Institute of Technology. „This program involved eight graduate students working full-time, with another five or six fluctuating in and out,“ Hetzel said. „We came up with $500,000 and a full-time person to monitor the project. The students pledged that within two years they could come up with a fully documented prototype for us. And they did it! If you can designate a project that can be completed within a reasonable period of time, if you control the intellectual property, and if you can assign a staff person to devote 150 percent of his or her time to it, you will get results.“

The real challenge in creating alliances between big companies and small companies, said Hetzel – who, like Calhoun, has extensive experience with pharmaceutical alliances – is to mesh the goals of very different companies. „This is a people-driven activity,“ he explained. „Legal agreements alone won’t cut it. You need people on both sides who can work together, who respect each other.“

„We’ve been at this for 10 years,“ Hetzel continued. „We started the traditional way: make an equity investment, get a license, take a board seat. But we failed to focus on the conflicting strategies of the two firms. So lately we spend much more time on the prenuptial agreement, building not just legal contracts but shared understanding. We’ve just begun an interesting experiment. We are creating a cross-functional, cross-company team. The companies are separated by 2,000 miles and everything else you can think of. But we are creating a team that is trying to work together. I’ll report back in two years!“

On People, Teams, and Change

The sessions produced immediate and unanimous agreement on the Big Three:

• A world of ever-changing technology and global competition requires new ways of working.

• These new ways of working require teamwork and new forms of leadership.

• The need for teamwork and leadership requires new approaches to making change happen in organizations.

Avery Dennison’s Germeraad was clear about the urgency he felt. „I need a fast way to change human behavior so that it sustains and builds creativity,“ he said. „I have fast ways to change behavior, but I haven’t found one that sustains creativity.“

Arthur D. Little’s Thompson spoke of the need to discover the ‘unwritten’ rules that often hinder change initiatives within corporations. He went on to explain the Arthur D. Little approach to helping companies understand and reshape their „unwritten rules of the game“ to accelerate the success rates of corporate change initiatives – not only to change behaviors but to sustain the change for long-lasting results.

Reece accepted the challenge and offered an in-depth look at the radical changes underway at Pitney Bowes. On the surface, he said, Pitney Bowes remains a remarkably successful company: annual revenues of $3.5 billion, net return on sales of more than 9 percent, return on equity of 19 percent, a p/e ratio of 20. *Yet* like so many manufacturers of electromechanical products, the company faces direct and indirect competition from software-driven rivals that promise major advances in price-performance and functionality. To initiate change, Pitney Bowes reorganized product development around cross-functional teams with the authority to make critical decisions.

More nodding heads. Everyone could agree on the need to shift to more horizontal forms of work. And everyone saw the huge obstacles in the way. „We have exactly the same process underway at Becton Dickinson,“ Hetzel said. „One real challenge is the tension between the team and the functional leader. It is a wrenching change for a detail-oriented engineering manager to back off and ‘let Joe run the project,’ instead of micromanaging it. We’ve lost people because they couldn’t make the shift. They left. If you move to this style of work, expect tension – and turnover – with your functional leaders.“

„The role and behavior of the product approval committee is key,“ added Reece. „Typically, the committee is made up of the operating people in the division. But they don’t behave in their functional jobs the way they need to behave for the committee to work. It’s curious, but it’s true. Functional work is very stylized.“

„We have to change the mission statement for a product approval committee,“ offered Avery Dennison’s Germeraad. „The new role of the committee is to accelerate success, not to assign blame for failure. It’s about mentoring, not auditing.“

Al Wechsler of Arthur D. Little listened to this exchange and challenged the group with an intriguing question: „What's the critical success factor for teams? A great team leader or great team processes? If you have a great process, do you still need great leaders? Or if you have a great leader, does process matter?" It was an impossible question to answer. But everyone agreed that the essence of leadership was changing – and new-style leaders were in perilously short supply.

„The people on our teams are really excited and empowered," said Hetzel. „The scarce resource is the core team leader." Reece agreed: „The role of senior management has changed. The new role of senior management is to give the team permission to do what it takes to get the job done, and to accept the outcome – even if it disagrees with the outcome. It's a whole different ball game for us. It's no longer a question of deciding what should be done and how I am going to get it done. It's, 'Do we have the right people, do they have the right tools, are we bringing them along in the right way?' That's a tough transition."

Which raises the obvious – and urgent – question. How do you encourage new ways of working and leading? Can you pay for teamwork?

„We've put in gain-sharing, profit-sharing, and results-sharing," said Arthur Chester of GM Hughes Electronics Corporation. „All kinds of financial and other incentives, for units of a hundred to a thousand people, are directly reflected in their paychecks. If you're willing to say that a team can be a few hundred people – which in our business it can be – you can do it. But on a microscale – small teams – it's much harder. We use qualitative rather than quantitative measures. Team performance becomes a criterion for promotion and evaluation, but without striking a bargain with managers that says, 'If your team does this, you'll all get a raise.'„

„We've taken compensation out of the picture for the most part," said Avery Dennison's Germeraad. „We have a process that tries to pay every individual fair market value. If people don't think they are paid fairly, they can essentially 'float a resume' on the open market and we'll target what they are offered. We have lots of team-based recognition. But we don't pay for team performance."

Rob Wills of The R.W. Johnson Pharmaceutical Research Institute added his voice to the concerns about the complexity of paying for teamwork – even as he recognized its importance. „The best people in the line organizations are made project managers, regardless of their impact on the line," Wills said. „But you can't reward project teams explicitly, because people will ignore their functional duties. We have implicit rewards: if this project works, members of the team and people who helped the team will get rewards. It's understood. But it's not promised in advance."

Of course, the flip side of rewards is risk. A commitment to delegation and empowerment raises a host of thorny questions. For example: How do you strike a balance between trust and security? Senior managers want people to be bold enough to do „what's right" for the company – but what if what's right for the company means shutting down their project or cutting back research dollars for their operation? If top management doesn't give people the security to make the right decisions, can they expect people to act against their own interests? On the other hand, if teamwork eliminates all personal risk („just be a good team player and don't worry"), will people be motivated to perform?

„You can't get people into these projects if all the risk is on their shoulders," noted Pitney Bowes' Reece. „But for a core team leader, the success or failure of a project should have a major effect on his or her career. If a project doesn't succeed, then there should be accountability. And success doesn't necessarily mean successfully delivering a product. If shutting down a project early means that the company saves $20 million in R&D funds that would have been wasted, that's a management success."

Conclusions

For senior managers responsible for technology and new-product development, this is, to borrow a phrase, the Age of Paradox:

• Big companies are hungry for the predictability of innovation „systems" – even as they seek the breakthrough creativity that comes only from chaos.

• Senior executives clamor for comprehensive technology strategies – even as they question the value of „technology vision" and demand concrete measures for tracking R&D performance and productivity.

• Companies work to build internal core competencies – even as they strike hard-to-manage alliances to survive in a world where technology changes so fast that no one company can master everything.

• R&D groups struggle to promote teamwork – even as they look for strong leaders with new kinds of skills.

Over the course of two days, with contributions from some of the leading executives in product and technology management, the Arthur D. Little „Best of the Best" Colloquium generated many important insights about managing through these paradoxes. As one participant commented:

„It’s messy, complex, dangerous, and risky. But we must move forward. We have no choice.“

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